



## Weird FPV Drone



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### Summary

A nearly indestructible and fully 3D printed, modular FPV drone of the miniature variety. And it's s e x y as always.

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Countless hours spend poring over a screen into the small hours of the night. Many a cup coffee chugged. All so you could power trip while flying the 3d printed equivalent of a mosquito on steroids. Enjoy my friends, the majestic [REDACTED] drone.

Now to get a bit more technical:

This is a 3 inch drone frame. Mine is printed using carbon fiber PETG for the plates and translucent red PETG for the arms. I'll list out the specific electronic and mechanical hardware that I used below, I know this combo works and pretty damn well at that. If you don't wanna choose parts for yourself, follow this list.

## Electronics:

- AIO flight controller ESC - JHEMCU GF16-BMI 16X16mm 2-4S Stack: [https://www.aliexpress.us/item/2251832697381294.html?spm=a2g0o.order\\_list.order\\_list\\_main.4.1ad71802ASurZg&gatewayAdapt=glo2usa&randl\\_shipto=US](https://www.aliexpress.us/item/2251832697381294.html?spm=a2g0o.order_list.order_list_main.4.1ad71802ASurZg&gatewayAdapt=glo2usa&randl_shipto=US)
- VTX - HGLRC Zeus Nano: [https://www.aliexpress.us/item/3256802524762750.html?spm=a2g0o.order\\_list.order\\_list\\_main.55.1ad71802ASurZg&gatewayAdapt=glo2usa&randl\\_shipto=US](https://www.aliexpress.us/item/3256802524762750.html?spm=a2g0o.order_list.order_list_main.55.1ad71802ASurZg&gatewayAdapt=glo2usa&randl_shipto=US)
- Camera - RunCam Nano 2 w/ 2.1mm lens: [https://www.aliexpress.us/item/3256803814960647.html?spm=a2g0o.order\\_list.order\\_list\\_main.59.1ad71802ASurZg&gatewayAdapt=glo2usa&randl\\_shipto=US](https://www.aliexpress.us/item/3256803814960647.html?spm=a2g0o.order_list.order_list_main.59.1ad71802ASurZg&gatewayAdapt=glo2usa&randl_shipto=US)
- ELRS receiver - (Ok literally any micro ELRS receiver will do, but I used the HAPPYMODEL EXPRESSLRS 2.4GHZ EP2 w/ ceramic antenna) [https://www.defiancerc.com/products/happymodel-expresslrs-2-4ghz-ep2-nano-tcxo-receiver?\\_pos=3&\\_sid=974c3de92&\\_ss=r](https://www.defiancerc.com/products/happymodel-expresslrs-2-4ghz-ep2-nano-tcxo-receiver?_pos=3&_sid=974c3de92&_ss=r)
- Motors - flashhobby A1106 1106 6500kv Brushless Motor: [https://www.aliexpress.us/item/2251832722738055.html?spm=a2g0o.order\\_list.order\\_list\\_main.89.1ad71802ASurZg&gatewayAdapt=glo2usa&randl\\_shipto=US](https://www.aliexpress.us/item/2251832722738055.html?spm=a2g0o.order_list.order_list_main.89.1ad71802ASurZg&gatewayAdapt=glo2usa&randl_shipto=US)
- Battery - **Only 2s OR 3s** (At 3S the ESC can handle 3020 props at most, and the motors can't handle 4s at all) battery between 500 and 1000mah. At the moment my favorite battery to use for this drone is this one: [https://www.amazon.com/TATTU-Battery-650mAh-Torrent-Lizard/dp/B071GBGBB4/ref=sr\\_1\\_2\\_sspa?crid=AOCXSAFRMEE3&keywords=tattu&qid=1688486035&srefix=tattu%2Caps%26spons&sp\\_csd=d2lkZ2V0TmFtZT1zcF9hdGY&psc=1](https://www.amazon.com/TATTU-Battery-650mAh-Torrent-Lizard/dp/B071GBGBB4/ref=sr_1_2_sspa?crid=AOCXSAFRMEE3&keywords=tattu&qid=1688486035&srefix=tattu%2Caps%26spons&sp_csd=d2lkZ2V0TmFtZT1zcF9hdGY&psc=1)
- **CONTROLLER** - Any 2.4ghz ELRS transmitter will do. I am using the iFlight Commando 8: [https://www.defiancerc.com/products/iflight-commando-8-expresslrs-2-4ghz-radio-transmitter?variant=40149241593925&cy=USD&utm\\_medium=product\\_sync&utm\\_source=google\\_spOMYZx0KNoJ802KjWH14zCv9fZTnCzhpVU2akDxoCWRIQAvD\\_BwE](https://www.defiancerc.com/products/iflight-commando-8-expresslrs-2-4ghz-radio-transmitter?variant=40149241593925&cy=USD&utm_medium=product_sync&utm_source=google_spOMYZx0KNoJ802KjWH14zCv9fZTnCzhpVU2akDxoCWRIQAvD_BwE)

## Mechanical Parts:

- 22x M2x3 insert nuts (16 for the arms, 6 for the plates)
- 32x M2x6 screw (16 for securing arms to plates, 16 for attaching motors)
- 4x M2x5 screw (for securing rear cover)
- 2x M2x16 screw (for securing camera guards)
- 4x M2x14 **low profile\*** screw **and** 4x M2 nut (for attaching flight controller esc stack)
- Additional\* - You will need 2x M2x7 screws for attaching the camera and 8x M2x7 screws for attaching the propellers, but at least in my case, plenty of M2x7 screws were included with the motors I ordered.
- 4x 3020 propeller (or any another 3 inch propeller, or even 2.5 inch for that matter)

- 10mm x 180mm velcro strap: <https://www.getfpv.com/lumenier-indestructible-kevlar-lipo-strap-10x180mm-3pcs.html>

\*low profile screws are preferable for mounting the stack because that way the heads will not protrude from the bottom of the drone and will allow you to safely strap batteries to the bottom.

### **Total Cost Estimate:**

- **Drone:** ~ \$120 before tax
- **Transmitter:** \$90+

### **Assembly Guide:**

**(please have some prior drone experience, that said I'll be happy to help just leave a comment or something if you've got a question)**

1. Go ahead and print off all the parts. I'll wait. Oh, I should mention - use the good settings, no supports needed for anything, and I strongly recommend using TPU for the camera guards and rear cover, and a nice, strong, heat and impact resistance material like PETG or ASA for everything else.
2. Prepare the parts by putting all the insert nuts where they need to go.
  - Each arm has four holes for M2x3 insert nuts, two on its top and two on the bottom. Use a soldering iron to install them.
  - The bottom plate takes four M2x3 insert nuts, two in the front and two in the back.
  - The top plate needs only two M2x3 insert nuts, both of them in the back.
3. Now, for the electronics. Start with the motors, thread the wires through the drone's arms, then tighten the motors down with sixteen M2x6 screws, be careful not to overtighten.
  - Snip the motor wires so that there is 15-20mm of slack poking out of the arms.
  - Strip back about 2mm of bare wire
4. Poke the four M2x14 screws through the flight controller mounting holes of the bottom plate. Seat only the ESC half of the stack on those screws.
5. Prepare your battery connector of choice, and solder it to the battery pads of the ESC. In my case, that would be the XT-30.
  - Make sure the power wires are at least 18 AWG
  - Make sure the power wires are about 60mm long, to ensure there will be enough slack.
  - Route the power wires between the VTX mounting pegs.
  - If you wish to add a capacitor, now's the time to do it, though make sure it's small enough to fit.

6. **Be careful soldering**, solder each motor to its proper motor pads (preferably using a pair of tweezers), then use eight M2x6, two per arm, to fasten the arms to the bottom plate. You don't have to worry about what direction the motor will spin, because that can be changed in betalight, but make sure that arms A and arms B are in the right spots, not mixed up.
7. Now, seat the flight controller half of the stack onto the ESC, and secure it using the four M2 nuts.
8. Solder up wires to the VTX, if it arrived unsoldered.
  - If you're using the Zeus Nano as I did, you can snip off all but the closest mounting points, and mount to the built in mounting pegs of in the back of the bottom plate.
  - The screws go directly into the plastic.
  - Make sure you mount with the antenna port facing up.
  - If you are not using the Zeus Nano, you can edit the .step files to fit your VTX or just kinda mush it in there and hope for the best.
9. Solder the VTX wires to their proper spot on the flight controller
10. Solder your camera to its proper plate on the flight controller
11. Lastly, the receiver. If it came with wires soldered on already, great! If not, solder them on yourself. I believe all ELRS receivers use 4 wires. Once you've done that, solder the connections to their proper spot on the flight controller.
12. Push your antenna through the antenna hole of the rear cover, and snap the connector into its place on the VTX. I purchased the Zeus Nano option that comes with a RUSH Cherry Antenna, it is the perfect size and its stem is exactly 4mm in diameter, and the drone was designed to accommodate it, but thinner antennas will fit through the hole as well. Use a small zip tie to secure the antenna if there isn't enough friction to hold it.
13. Excellent! We've got the flight stack and all of the electronic components wired up!
14. Grab the two camera guards. Using two M2x7 screws, tighten one to either side of your camera. Make sure not to mix up the left and right one.
15. Now, using two M2x5 screws, attach the rear cover to back of the bottom plate. Make sure that you direct the power wires through the hole formed between the rear cover and the bottom plate.
16. You're approaching near completion, it's the final lap! All that's left to is:
  - Nestle the receiver somewhere in front of the FC/ESC stack, it doesn't have to be perfect, just enough so the camera will still fit.
  - Slide the top plate into position above everything else and use the remaining eight M2x6 screws to tighten it down around the arms, going in a crisscross pattern, the last two M2x5 screws in the rear.

- Slide the camera with the camera guards into its spot between the top and bottom plate. It may take a bit of finessing, but once you get it, secure it with the two M2x16 screws.

17. And with that, you're all done! Happy flying my dudes.

Alright alright alright. I know. There's still a lot of configuration to do. I'm, not gonna go into detail about that here, but If you are new to this check out Joshua Bardwell on YT. As far as drones go, the guy's my lord and savior. He will teach you everything you need to know. I will say, if you find that your motors are spinning in the wrong direction, you can change that configuration. And with that I'll say, good luck, fellow pilots.

## Model files



**mini-top-plate.stl**



**mini-bottom-plate-16x16-stack.stl**



**mini-arm-a.stl**



**mini-arm-b.stl**



**mini-cam-guard-l.stl**



**mini-cam-guard-r.stl**



mini-rear-cover.stl

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